

REMARKS

Claims 1, 15 and 48 have been amended to more clearly describe Applicants' invention. Support for the amendments can be found throughout the specification, for example, at page 9 lines 10-20 of the specification. Claim 49 has been cancelled. No new matter has been added. Claims 1-50 are pending. Claims 1, 15, 24, 32, 43, 45, 48 are independent.

Claim Objections

Claims 1-14 and 48-50 have been objected to for failing to indicate what element's temperature is being determined. See Office Action at page 2. Claims 1 and 48 have been amended to correct the informality. Claims 2-14 and 49-50 are objected to for being dependent on an objected base claim. Applicants have amended the base claims to remove the informalities and believe all of the claims are now in proper form.

Claim 49 has been objected to for reciting a limitation already present in claim 1. See Office Action at page 2. Claim 49 has been cancelled.

Applicants respectfully request reconsideration and removal of these objections.

Rejections under 35 U.S.C. § 103(a)

Claims 1-31 and 48-50

Claims 1-31 and 48-50 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application 2002/0006153 to Ranson *et al.* ("Ranson"), in view of U.S. Patent No. 6,322,901 to Bawendi *et al.* ("Bawendi"), and U.S. Patent No. 5,986,272 to Britton, Jr. *et al.* ("Britton"). See Office Action at pages 2-3. Claims 1, 15, 24 and 48 are independent.

Claims 1 and 48 and claims dependent therefrom

Applicants have discovered a method of sensing temperature including providing a temperature sensor including a matrix on a surface of a substrate, where the matrix includes a semiconductor nanocrystal in a binder. See independent claims 1 and 48.

The Examiner asserts that

it would have been obvious to one skilled in the art at the time the invention was made to modify the method disclosed by Ranson by replacing the luminescent element with the luminescent element disclosed by Bawendi since Britton teaches that fluorescent phosphors are thermographic phosphors, and these elements are

therefore alternate types of thermographic phosphors that can be used to determine temperature.

See Office Action at page 4.

Applicants respectfully disagree. At the very least, Ranson fails to provide a matrix on the surface of the substrate and a semiconductor nanocrystal in a binder. Ranson does not teach, suggest, or motivate one skilled in the art to include a matrix on the surface of a substrate or a semiconductor nanocrystal in a binder. Ranson describes applying a thin film thermographic coating made from yttrium oxide doped with europium to a component. See Ranson at page 2 paragraph 0027. Thus, Ranson fails at the very least to describe or suggest a matrix on the surface of a substrate and a semiconductor nanocrystal in a binder.

Bawendi fails to cure the deficiencies of Ranson. Bawendi describes various preparation techniques for semiconductor nanocrystals. See Bawendi at column 4, line 9 to column 11, line 6. Bawendi does not teach, suggest, or motivate one skilled in the art to provide a semiconductor nanocrystal in a binder or a matrix on the surface of a substrate.

Finally, Britton fails to cure the deficiencies of either Bawendi or Ranson. Britton describes a method for determining the decay time constant of a fluorescing phosphor. See Britton at column 2, lines 11-17. Britton does not teach or suggest a matrix on the surface of a substrate or a semiconductor nanocrystal in a binder. The Examiner asserts that Britton discloses that all fluorescent phosphors are thermographic phosphors. See Office Action at page 4. Applicants respectfully disagree. The statement referred to in Britton is a characterization of prior art in Britton's Background section and states, "[A] general discussion of temperature measurements using fluorescing phosphors (also called thermographic phosphors) is contained in" See Britton at column 1, lines 39-41. This statement only indicates the belief of Britton's drafters. It does not even reflect the beliefs of the authors of the article cited by Britton. As such, it is inadequate as evidence that all fluorescing phosphors are necessarily thermographic phosphors, or even that one should expect them to be.

Finally, the Examiner appears to be using hindsight to reconstruct Applicants' patent from prior art with no motivation provided for combining the references. For example, there is no motivation provided in Ranson to select any material other than yttrium oxide doped with europium. There is no motivation provided in Bawendi to use the semiconductor nanocrystals in

a method of determining temperature. Britton fails to teach or suggest a matrix on the surface of a substrate and semiconductor nanocrystals in a binder. The Federal Circuit has made it clear that obviousness cannot be established simply by stitching together pieces of prior art using the patent as a template. Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1143 (Fed. Cir. 1985); see also Loctite Corp. v. Ultraseal Ltd., 781 F.2d 861, 873 (Fed. Cir. 1985) (denouncing courts' tendency to depart from proper standard of nonobviousness "to the tempting but forbidden zone of hindsight."); In re Fine, 837 F.2d 1071, 1075 (Fed. Cir. 1988) ("One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention."); In re Dembiczak, 175 F.3d 994, 999 (Fed. Cir. 1999) ("Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references."). The cited references must provide some suggestion, motivation, or teaching for combining known components. See Heidelberger Druckmaschinen AG v. Hantscho Commercial Prods., Inc., 21 F.3d 1068, 1072, 30 USPQ2d 1377, 1379 (Fed.Cir.1994) ("When the patented invention is made by combining known components to achieve a new system, the prior art must provide a suggestion or motivation to make such a combination."); C.R. Bard, Inc. v. M3 Systems, Inc., 157 F.3d 1340 (Fed. Cir. 2000). The requisite motivation to combine the references in this case has not been provided. Thus, the Examiner has not presented a *prima facie* case of obviousness.

Accordingly, independent claims 1 and 48 and the claims that depend therefrom are patentable over Ranson in view of Bawendi and Britton. Applicants respectfully request reconsideration and withdrawal of this rejection.

Independent claims 15 and 24 and claims that depend therefrom

Applicants have also discovered a temperature sensor and a temperature sensing coating including a matrix containing a semiconductor nanocrystal, the matrix formed from a semiconductor nanocrystal and a binder. See independent claims 15 and 24.

The Examiner contends:

it would have been obvious to one skilled in the art at the time the invention was made to modify the method disclosed by Ranson by replacing the luminescent element with the luminescent element disclosed by Bawendi since Britton teaches that fluorescent

phosphors are thermographic phosphors, and these elements are therefore alternate types of thermographic phosphors that can be used to determine temperature.

See Office Action at page 4.

Applicants respectfully disagree. Each of Ranson, Bawendi, and Britton fails to teach, suggest or motivate one skilled in the art to include a matrix containing a semiconductor nanocrystal. Nothing in Ranson combined with Bawendi and Britton teaches or suggests providing a matrix containing a semiconductor nanocrystal. Furthermore, for the reasons discussed above, the Examiner has failed to present a *prima facie* case for obviousness by failing to provide a motivation to combine the three cited references.

For at least these reasons, claims 15 and 24 and the claims that depend from them are patentable over Ranson in view of Bawendi and Britton. Applicant respectfully requests reconsideration and withdrawal of this rejection.

Claims 32, 33, and 37-47

Claims 32, 33 and 37-47 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,075,493 to Wickersheim ("Wickersheim") in view of Bawendi, Britton, and U.S. Patent No. 5,233,020 to Hase *et al.* ("Hase"). Claims 32, 43 and 45 are independent.

Claim 32 and claims dependent therefrom

Applicants have described a temperature sensing paint including a semiconductor nanocrystal in a binder and a deposition solvent. See independent claim 32.

The Examiner asserts that

it would have been obvious to one skilled in the art at the time the invention was made to modify the paint disclosed by Wickersheim by replacing the luminescent element with the luminescent element disclosed by Bawendi since Britton teaches that fluorescent phosphors are thermographic phosphors, and these elements are therefore alternate types of thermographic phosphors that can be used to determine temperature.

Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the paint disclosed by Wickersheim by adding a solvent to the paint ingredients, as disclosed by Hase since it is known that a solvent is commonly used with a binder as an ingredient in paint.

See Office Action at page 6.

Applicants respectfully disagree. Each of Wickersheim, Bawendi, Britton, and Hase fails to teach, suggest, or motivate one skilled in the art to provide a semiconductor nanocrystal in a binder and a deposition solvent. Wickersheim describes a technique for measuring the temperature of an object or an environment by providing a layer of thermographic phosphors that luminesce at two different isolatable wavelengths when exposed to an excitation wavelength of light and comparing the relative intensities of the two emissions. See Wickersheim at column 2, lines 40-44 and column 7, lines 10-35. Wickersheim does not provide motivation to use any materials besides combinations of any of lanthanum, gadolinium and yttrium with any of praseodymium, samarium, europium, terbium, dysprosium, holmium, erbium, and thulium. See Wickersheim at column 6, lines 9-41.

Bawendi describes various preparation techniques for semiconductor nanocrystals. See Bawendi at column 4, line 9 to column 11, line 6. Bawendi does not provide any motivation to use semiconductor nanocrystals in a temperature sensitive paint.

Britton describes a method for determining the decay time constant of a fluorescing phosphor. See Britton at column 2, lines 11-17. Britton provides no motivation for use with a temperature sensitive paint and does not provide motivation to use semiconductor nanoparticles in such a paint let alone in a binder and a deposition solvent.

Hase describes the use of poly-N-acylalkyleneimines as an oxidatively crosslinking constituent in paints. See Hase at column 1, lines 54-61. Hase does not provide any motivation for use in a temperature sensitive paint and does not provide any motivation for providing semiconductor nanocrystals in a binder and a deposition solvent.

Thus, none of the cited references or combinations of references provide a semiconductor nanocrystal in a binder and a deposition solvent. Finally, as discussed for each of the previous rejections, the Examiner has failed to present a *prima facie* case of obviousness by failing to provide motivation to combine the references and appears to be relying on hindsight to build applicants patent from pieces of asserted prior art references using the patent as a template.

Accordingly, claim 32 and the claims that depend from it are patentable over Wickersheim in combination with Bawendi, Britton and Hase. Applicants respectfully request reconsideration and withdrawal of this rejection.

Claim 43 and 45 and claims dependent therefrom

Claims 43 describes a method of manufacturing a temperature sensing paint including a semiconductor nanocrystal in a binder and a deposition solvent. See independent claim 43.

Claim 45 describes a method of manufacturing a temperature sensor that includes a semiconductor nanocrystal in a binder and a deposition solvent. See independent claim 45.

The Examiner asserts "in manufacturing the paint disclosed by Wickersheim, Bawendi, Britton, and Hase the method steps of claims 43-47 will inherently be followed." Applicants respectfully disagree. Each of Wickersheim, Bawendi, Britton, and Hase fails to teach, suggest, or motivate one skilled in the art to manufacture a temperature sensing paint or a temperature sensor that includes a semiconductor nanocrystal in a binder and a deposition solvent.

Wickersheim does not provide motivation to use any materials besides combinations of any of lanthanum, gadolinium and yttrium with any of praseodymium, samarium, europium, terbium, dysprosium, holmium, erbium, and thulium. See Wickersheim at column 6, lines 9-41.

Bawendi describes various preparation techniques for semiconductor nanocrystals. See Bawendi at column 4, line 9 to column 11, line 6. Bawendi does not provide any motivation to use semiconductor nanocrystals in a temperature sensitive paint.

Britton describes a method for determining the decay time constant of a fluorescing phosphor. See Britton at column 2, lines 11-17. Britton provides no motivation for use with a temperature sensitive paint and does not provide motivation to use semiconductor nanoparticles in such a paint let alone in a binder and a deposition solvent.

Hase describes the use of poly-N-acylalkyleneimines as an oxidatively crosslinking constituent in paints. See Hase at column 1, lines 54-61. Hase does not provide any motivation for use in a temperature sensitive paint and does not provide any motivation for providing semiconductor nanocrystals in a binder and a deposition solvent.

Thus, none of the cited references or combinations of references provide a semiconductor nanocrystal in a binder and a deposition solvent. Finally, the Examiner has failed to present a *prima facie* case of obviousness by failing to provide motivation to combine the references and

appears to be relying on hindsight to build applicants patent from pieces of asserted prior art references using the patent as a template.

Accordingly, claims 43 and 45 and the claims that depend therefrom are patentable over Wickersheim, Bawendi, Britton, and Hase alone or in combination. Applicants respectfully request reconsideration and withdrawal of this rejection.

Claims 34-36

Claims 34-36 have rejected under 35 U.S.C. § 103(a) as being unpatentable over Wickersheim, Bawendi, Britton, Hase, as applied to claims 32, 33, and 37-47 above, and further in view of the prior art disclosed by the Applicants ("Prior Art"). See Office Action at page 7. Claims 34-36 depend from independent claim 32.

Applicants have described a temperature sensitive paint that includes a semiconductor nanocrystal in a binder and a deposition solvent. See independent claim 32.

The Examiner asserts that "Wickersheim, Bawendi, Britton, and Hase disclose a paint having all of the limitations of claims 34-36 . . . except for the paint further comprising a pressure-sensitive composition" and that the "Prior Art discloses that temperature-sensing compositions can be used in combination with pressure-sensitive compositions including a platinum porphyrin" See Office Action at page 7. Applicants respectfully disagree. The combination of Wickersheim, Bawendi, Britton and Hase fails to disclose a semiconductor nanocrystal in a binder and a deposition solvent as previously discussed with respect to independent claim 32. The Prior Art that the Applicant disclosed on page 1 of the specification does not cure this deficiency. The Prior Art discusses coating objects with sensing compositions that emit light of varying intensities depending on temperature and oxygen pressure, and that the pressure sensing composition can be a porphyrin. See Specification at page 1 lines 13-25. The Prior Art does not teach, suggest, or motivate one skilled in the art to provide a semiconductor nanocrystal in a binder and a deposition solvent. Finally, once again the Examiner has failed to provide a motivation to combine the independent references and has failed to present a *prima facie* case for obviousness.

For at least these reasons independent claim 32 and claims 34-36 that depend therefrom are patentable over Wickersheim, Bawendi, Britton, Hase, and the Prior Art attributed to applicant. Applicants respectfully request reconsideration and withdrawal of this rejection.

Applicant : Alfred A. BARNEY et al.
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CONCLUSION

Applicant request that all claims be allowed.